TITLE: **CONTRIBUTION OF SEMI-VOLATILE ORGANIC MATERIAL TO AMBIENT $PM_{2.5}$**

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ABSTRACT

OBJECTIVE

The hypothesis of the proposed research is that fine particulate mass will be significantly under-determined in urban environments using single filter samplers such as the $PM_{2.5}$ Federal Reference Method (FRM) because of the loss of semi-volatile organic compounds (SVOC) from the particles during sampling and storage. It is postulated that fine particulate mass, including the semi-volatile fine particulate organic species, are an appropriate surrogate for the components of fine particles which are associated with observed mortality and morbidity effects in epidemiological studies. Further, it is postulated that the most important fraction of the semi-volatile organic material with respect to exacerbation of health problems will be semi-volatile secondary compounds formed from reactions of volatile organic material with ozone and nitrogen oxides. Under-determination of these semi-volatile species will tend to over emphasize the importance of non-volatile fine particulate components such as sulfate or may reduce the significance of correlations with measured health effects. The proposed research program will be a cooperative effort between BYU and NETL, Pittsburgh to determine the contribution of semi-volatile particulate organic compounds (SVOC) to total ambient suspended fine particulate mass.

Two specific tasks have been defined:

1. Data will be obtained for two sampling programs at the NETL facility in Pittsburgh. The first sampling program will be a year-long effort to identify the daily contribution of semi-volatile organic material to ambient $PM_{2.5}$ and determine the meteorological conditions which are associated with formation of high concentrations of fine particulate SVOC

2. The second year-long program will involve the determination of diurnal variations in total fine particulate SVOC and the contribution of nitrogen oxide containing SVOC to $PM_{2.5}$ under meteorological conditions which lead to high fine particulate SVOC.

ACCOMPLISHMENTS TO DATE

Sample collection during the first year at NETL has been initiated and viable samples collected beginning in late November 1999. During the first year's sampling program, 24-hour $PM_{2.5}$ mass and chemical composition are being determined with a PC-BOSS particle concentrator diffusion denuder sampler for the determination and characterization of fine particulate mass, including semi-volatile organic material lost from fine particles during sampling with a filter. The composition of the collected fine particles (sulfate, nitrate, acidity, ammonium ion, semi-volatile and non-volatile organic material, and soot) are being determined for samples collected to date.

PLANS FOR THE COMING YEAR

- Completion of collection and analysis of the samples for the 1st year effort.

- Analysis of selected samples for N-nitroso and nitrite containing SVOC.

- Establishment of correlations among the semi-volatile and non-volatile constituents, and meteorological conditions. The results obtained with the PC-BOSS will also be compared to FRM and TEOM® monitor determined fine particulate mass obtained by FETC.

- During the second year, samples collected during meteorological conditions which lead to high SVOC will be analyzed to determine the diurnal variations in concentrations of SVOC and N-nitroso-, nitro, nitrite- and nitrate- containing non-volatile and semi-volatile organic material

SIGNIFICANCE TO FOSSIL ENERGY PROGRAMS

The combined experiments being conducted will quantify the semi-volatile organic species lost from particles using conventional single filter samplers, identify the conditions under which substantial amounts of SVOC are present in $PM_{2.5}$ and determine conditions which lead to the presence of substantial amounts of potentially toxic NO_x -SVOC material in ambient fine particles. Identification of the extent of, composition of, and conditions under which particulate semi-volatile organic species are lost during sampling should allow a better assessment of the role which these major fine particulate species may play in the etiology of mortality and morbidity effects associated with exposure to fine particles. This will allow for the development of appropriate attainment strategies, the collection of better exposure data and an improvement in risk assessment analyses.